



SNS COLLEGE OF TECHNOLOGY
An Autonomous Institution
Coimbatore-35



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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

23ECB101-CIRCUIT ANALYSIS AND DEVICES

I YEAR/ II SEMESTER

UNIT 1 – MESH AND NODE ANALYSIS OF ELECTRIC CIRCUITS

TOPIC – MESH ANALYSIS



Mesh Analysis



What is Mesh Analysis?

Mesh analysis is defined as

- The method in which the current flowing through a planar circuit is calculated.
- A planar circuit is defined as the circuits that are drawn on the plane surface in which there are no wires crossing each other.
- Therefore, a mesh analysis can also be known as loop analysis or mesh-current method.



Mesh Analysis



Procedure of Mesh Analysis

The following steps are to be followed while solving the given electrical network using mesh analysis:

Step 1:

To identify the meshes and label these mesh currents in either clockwise or counterclockwise direction.

Step 2:

To observe the amount of current that flows through each element in terms of mesh current.

Step 3:

Writing the mesh equations to all meshes using Kirchhoff's voltage law and then Ohm's law.

Step 4:

The mesh currents are obtained by following Step 3 in which the mesh equations are solved.

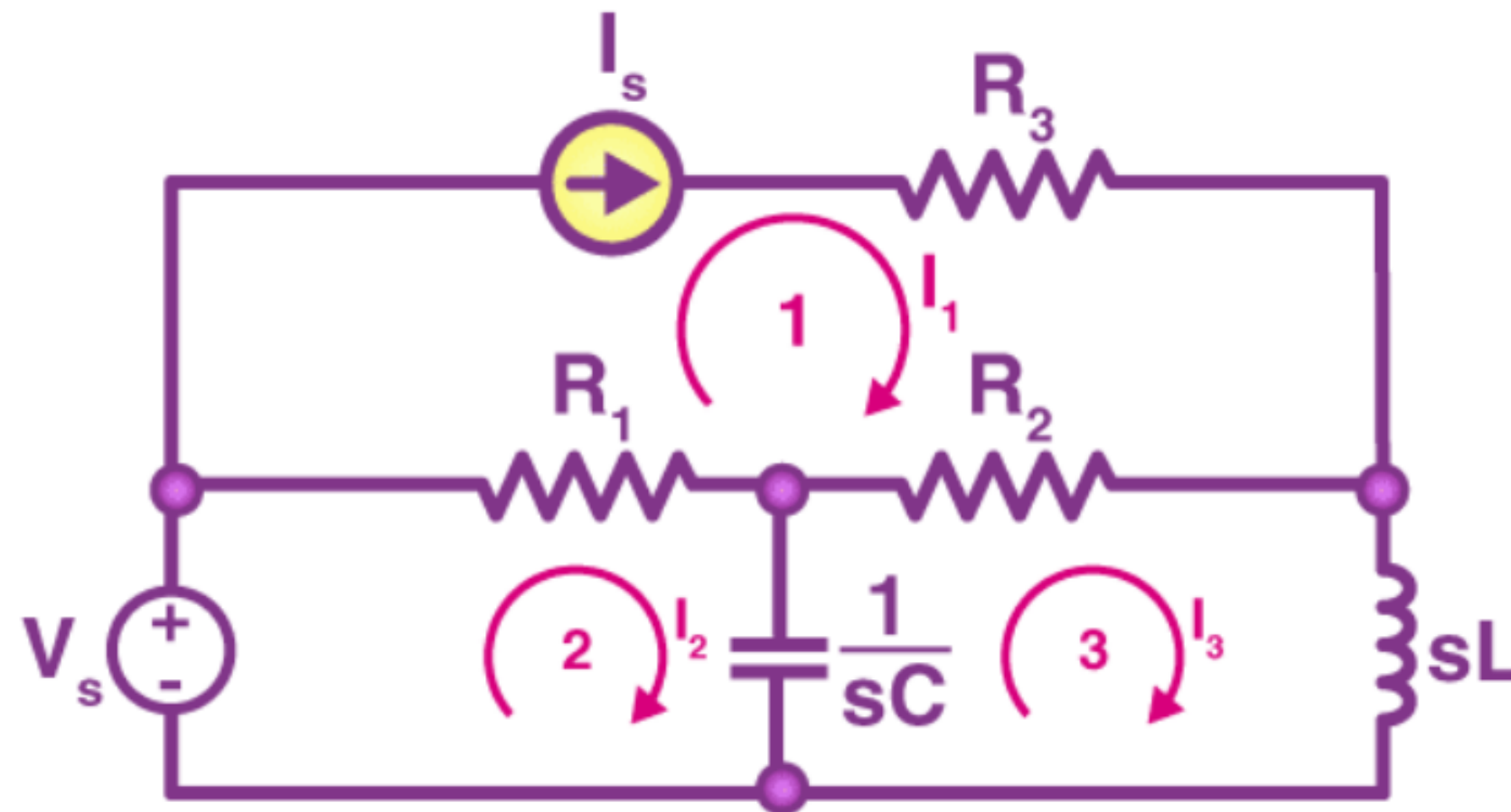


Mesh Analysis



Mesh Current Diagram

The below diagram is a circuit with mesh currents labelled as I_1 , I_2 , and I_3 and the arrows represent the direction of the mesh current.





Mesh Analysis



Mesh Current Diagram

The below diagram is a circuit with mesh currents labelled as I_1 , I_2 , and I_3 and the arrows represent the direction of the mesh current.

What is Super Mesh Analysis?

Super mesh analysis is used for solving huge and complex circuits in which two meshes share a common component as a source of current.



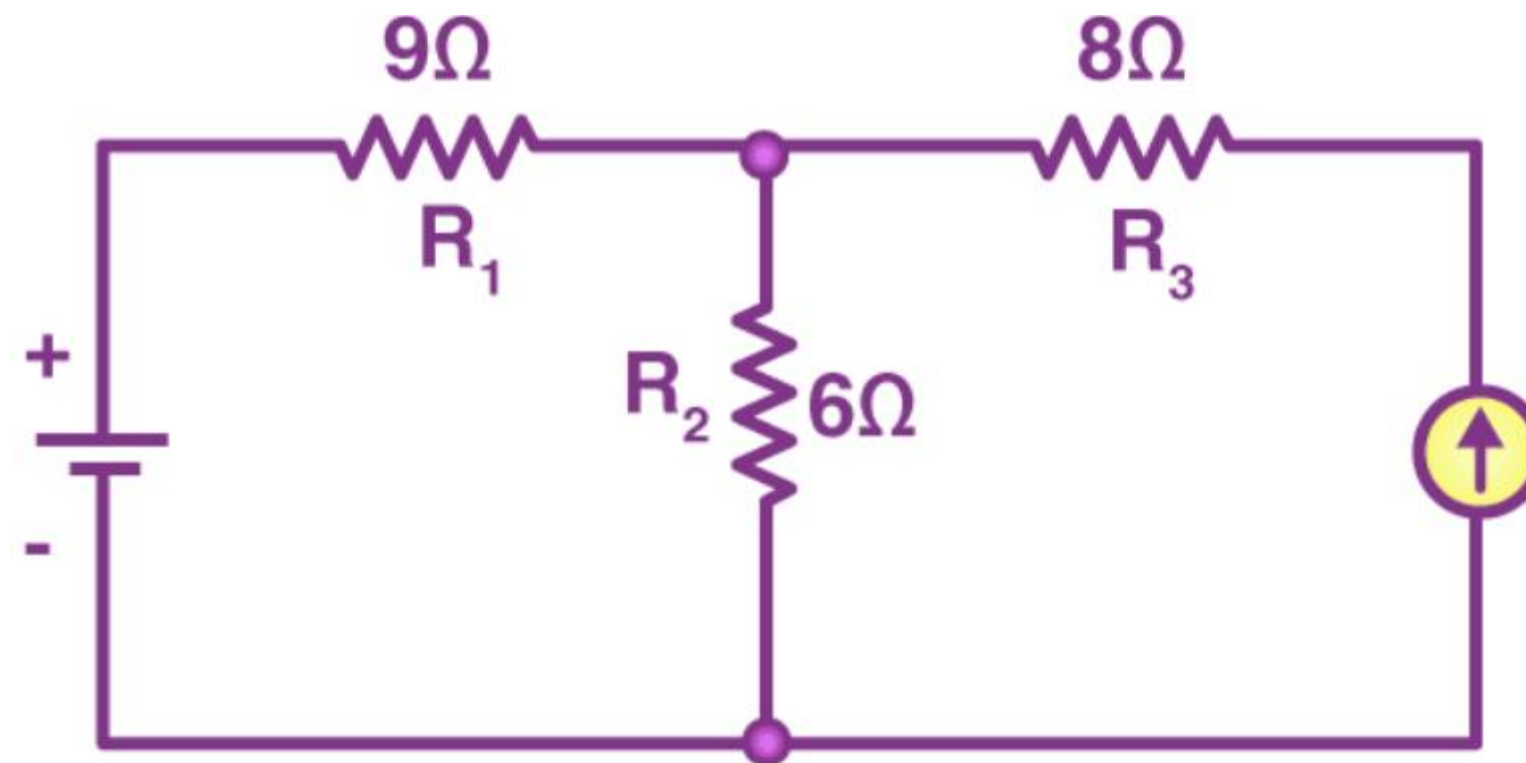
Mesh Analysis



Example of Mesh Analysis

Example 1:

In the given circuit 90v is the battery value, 5A is the current source and the three resistors are 9 ohms, 6 ohms, and 8 ohms. Using mesh analysis, determine the current across each resistor and potential difference.



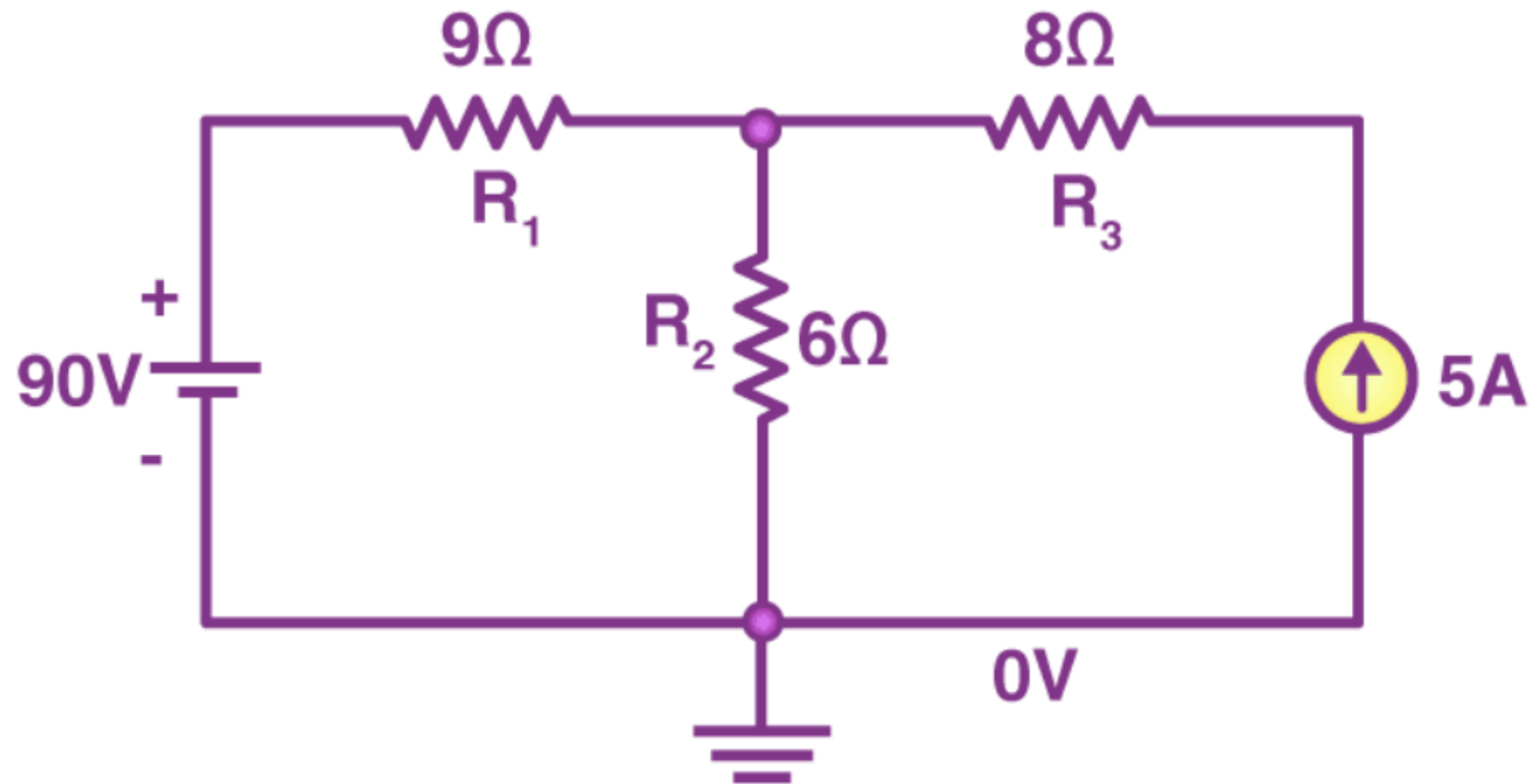


Mesh Analysis



Solution:

Let's first determine the ground as shown in the figure

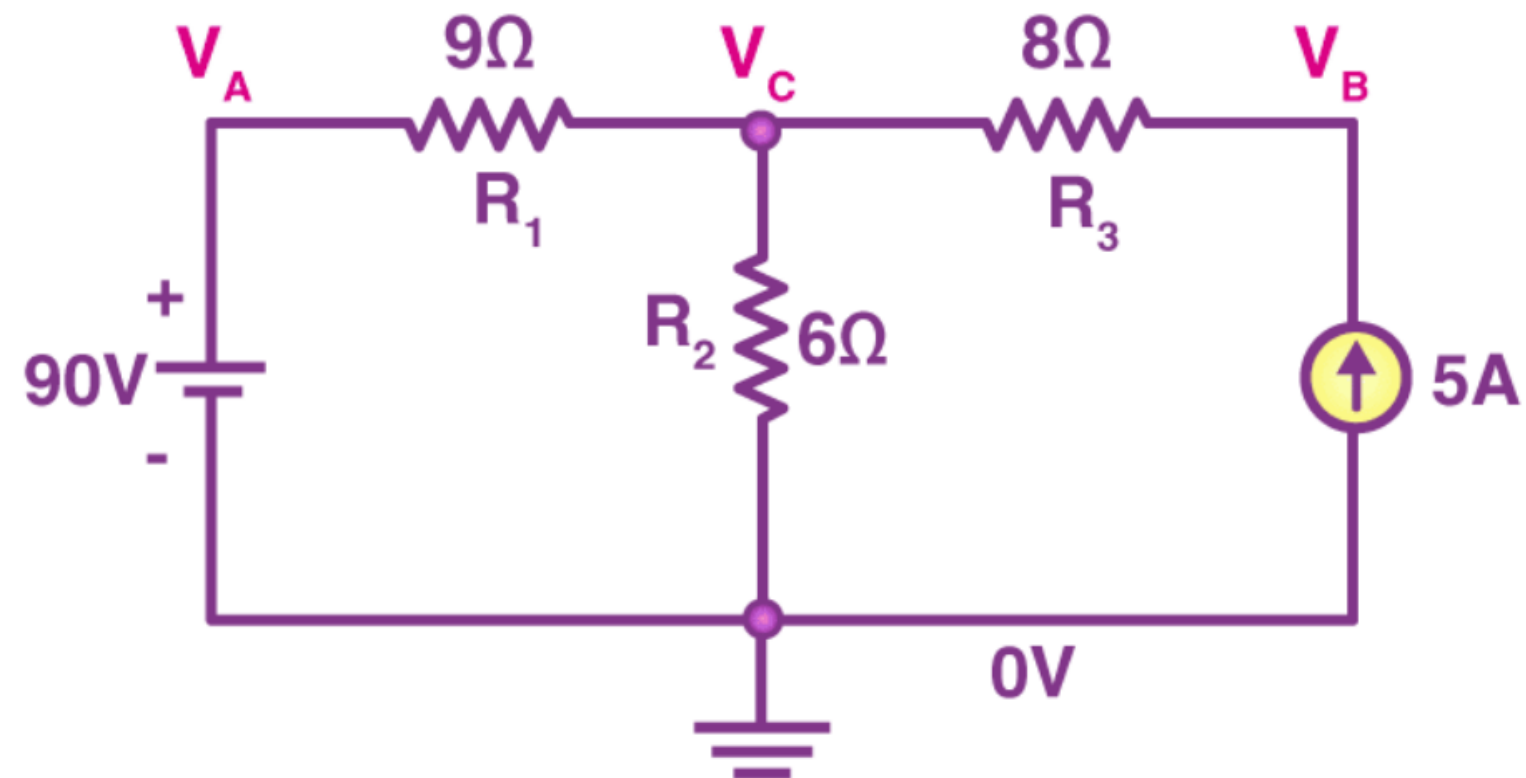




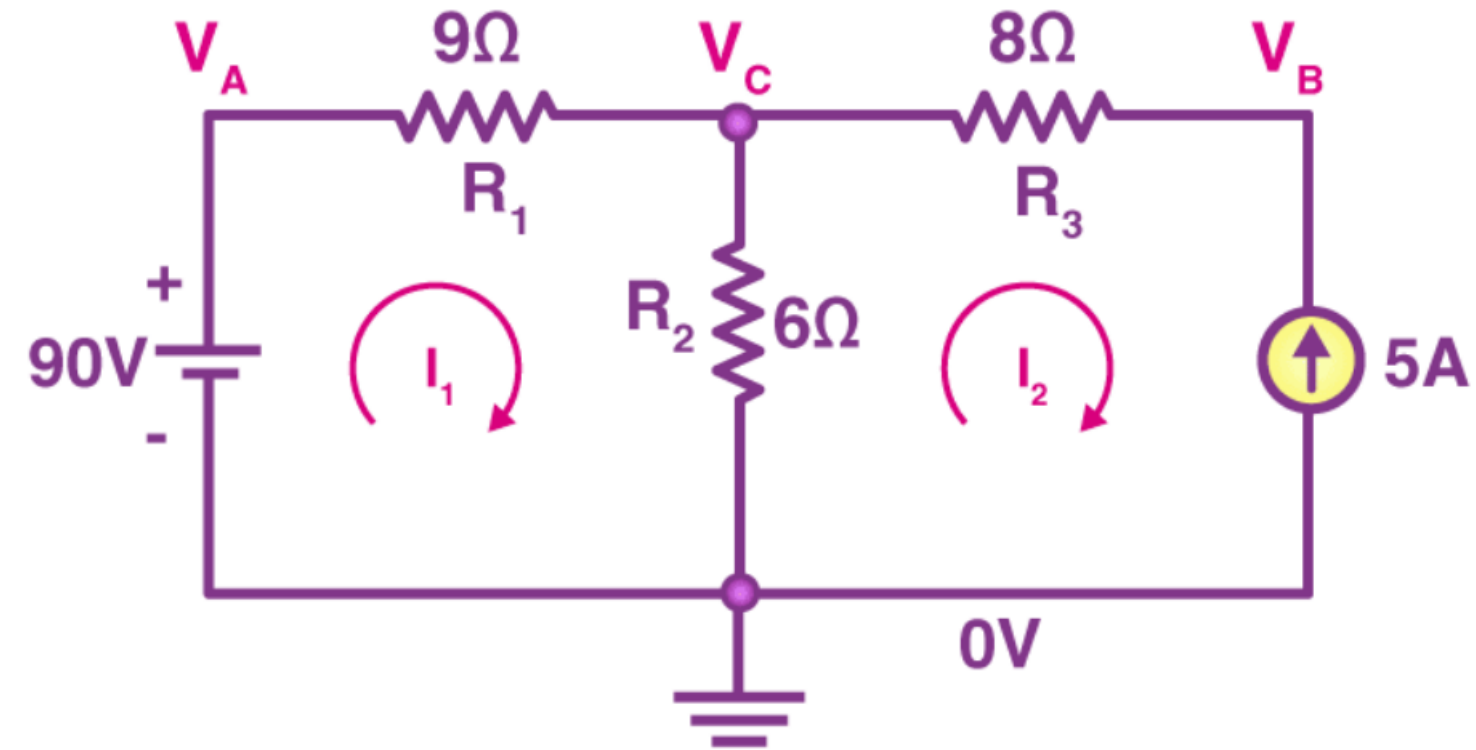
Mesh Analysis



Let the potential be V_A , V_B , and V_C as shown in the figure



Let I_1 and I_2 be the currents flowing through the two loops in the clockwise direction as shown in the figure





Mesh Analysis



Therefore,

$$+V_B - V_1 - V_2 = 0$$

$$90 - I_1 R_1 - R_2(I_1 - I_2) = 0$$

$$90 - 9I_1 - 6(I_1 - I_2) = 0$$

$$-15I_1 + 6I_2 = -90$$

$$5I_1 - 2I_2 = 30 \text{ (this is obtained by dividing the equation with -3)}$$

Substituting I_2 as -5 since the direction of I_2 is opposite to the actual direction of current

Therefore,

$$I_1 = 4A$$

So, through R_1 , 4A current is flowing and through R_3 , 5A current is flowing.

Now the potential difference at $V_A = 90V$

At V_B , the potential difference is $V_2 = I_2 - R_2$

Therefore, $V_B = 54V$

At V_C , the potential difference is $V_3 = I_3 - R_3$

$$V_C - 54 = 40$$

$$V_C = 94V$$



THANK YOU